

PYRGULOPSIS BRUNEAUENSIS, A NEW SPRINGSNAIL
(GASTROPODA: HYDROBIIDAE) FROM THE
SNAKE RIVER PLAIN, SOUTHERN IDAHO

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Abstract.—*Pyrgulopsis bruneauensis*, new species, from thermal springs along Hot Creek and Bruneau River in Owyhee County, Idaho (upper Snake River drainage), is described. Distinguishing features include a combination of small size (<2.8 mm shell height); globose-low conic shell; and penis with an elongate, muscular filament and a small lobe bearing a single distal glandular ridge. *Pyrgulopsis bruneauensis* appears closest morphologically to *P. amargosae* Hershler, 1989, from the Death Valley System to the south, but this opinion may require modification after other congeners from the Snake River region receive anatomical study.

The diverse molluscan fauna of the Snake River drainage includes several gastropods that lack formal description, despite their having been known to malacologists for a number of years. One of these is a spring-snail from the Hot Creek area of upper Snake River drainage in northern Owyhee County, Idaho, that was first collected by Borys Malkin in 1952 (letter, W. F. Barr to J. P. E. Morrison, 14 July 1953). Malkin's collection, plus one made by Barr in 1954, were sent to Morrison, who recognized the distinctiveness of the snail and used new manuscript genus and species names for it in the National Museum of Natural History (USNM) collection. Taylor (1982) later pursued additional field and laboratory study of this snail.

Springflows in the Hot Creek area have declined dramatically in recent years because of groundwater mining, and conservation of the Bruneau Hot Springsnail has become an important issue. This species has been proposed for listing under the Endangered Species Act (USDI 1985), and measures currently are being taken to protect remaining populations.

The author visited the Hot Creek area in June 1989 and made collections of the snail,

which were used to prepare the following description.

Family Hydrobiidae Troschel, 1857
Genus *Pyrgulopsis* Call and Pilsbry, 1886
Pyrgulopsis bruneauensis, new species
Bruneau Hot Springsnail
Figs. 1-6, Table 1

Bruneau Hot Spring snail.—USDI 1984:
21673.—USDI 1985:33803.

Warm Springs Snail.—Armantrout 1985:35.
“undescribed genus.”—Taylor 1985:291.

Material examined.—Spring along west side of Bruneau River, ca. 100 m downflow from Hot Creek's confluence with the river, Owyhee County, Idaho, T 7S, R 6E, SW ¼ sec. 34, USNM 860507 (holotype), USNM 860508 (paratypes; 18 dry shells and a large alcohol series), ANSP 376090 (paratypes; six dry shells), UF 161474 (paratypes; six dry shells).—Seep along south-east side of Hot Creek, ca. 50 m upflow from confluence with Bruneau River, T 8S, R 6E, NE ¼ sec. 3, USNM 860509.—Hot Creek Falls, T 8S, R 6E, NW ¼ sec. 3, USNM 791466 (Malkin coll.), USNM 860510 (Barr coll.).

Diagnosis.—A moderate-sized species with globose to low-conic shell. Penis with

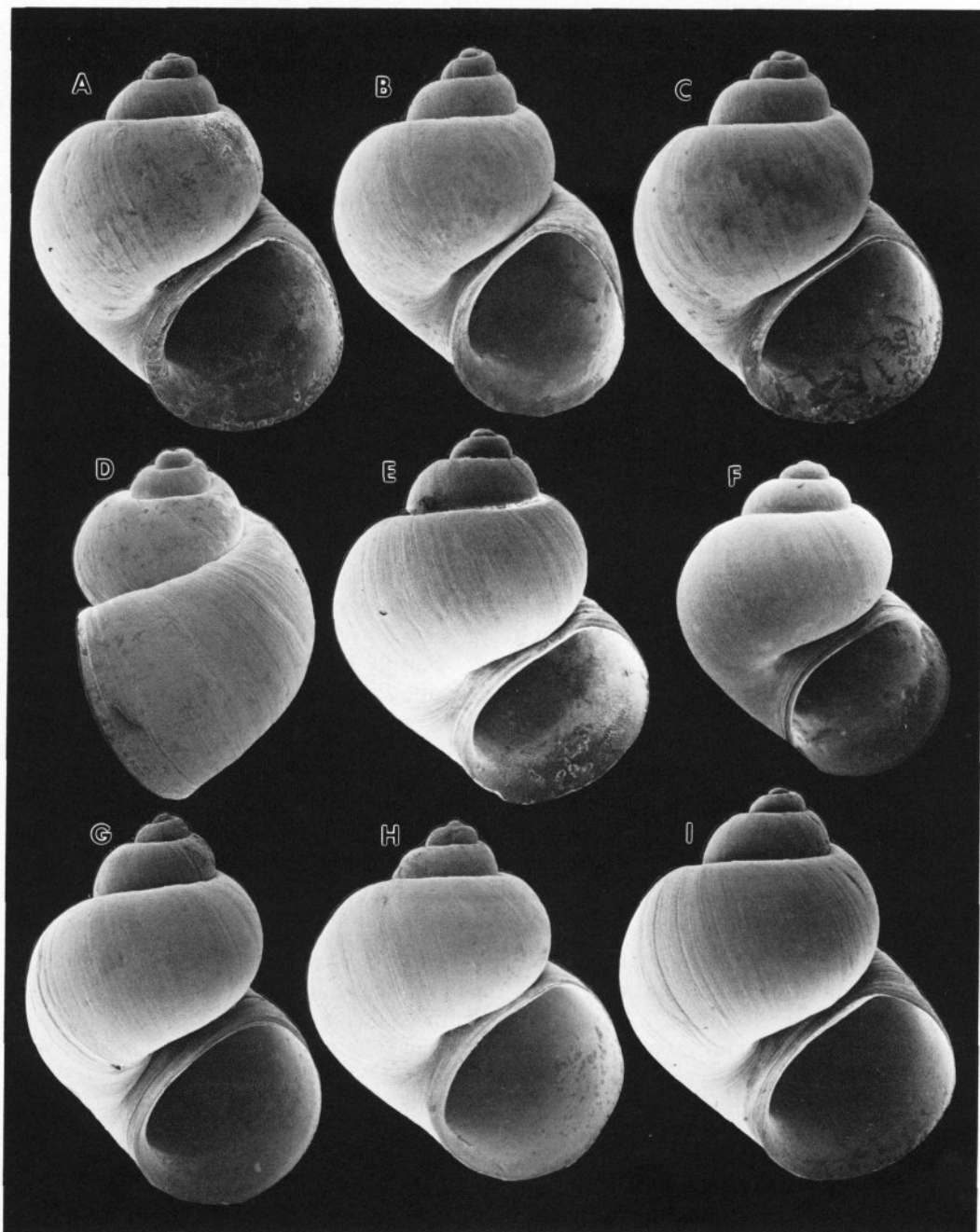


Fig. 1. SEM micrographs of shells of *Pyrgulopsis bruneauensis* Hershler, n. sp. a, Holotype, USNM 860507; b-d, Paratypes, USNM 860508, lot as above; e, f, USNM 791466; g-i, USNM 860509. The holotype is 2.48 mm tall (other micrographs printed to the same scale).

small lobe and elongate, muscular filament. Distal edge of lobe bearing a single glandular ridge.

Description.—*Shell* (Figs. 1, 2a, b): morphometric data were obtained as described in Hershler (1989) and are in Table 1. Thin, transparent, white-clear, but appearing black because of animal pigmentation. Slightly taller than wide; body whorl large (79–91% of shell height). Whorls, 3.75–4.25, rounded, with pronounced adapical shoulders. Aperture about 55% of shell height, ovate, slightly taller than wide, rounded below, very slightly angled above. Outer lip thin, slightly prosocline (Fig. 1d); inner lip thickened but not reflected, narrowly adnate above or slightly separated from body whorl. Umbilicus broadly open. Protoconch slightly protruding; surface usually whitened and slightly eroded, generally smooth although small area of wrinkled microsculpture sometimes visible (Fig. 2b). Teleoconch growth lines moderately pronounced; numerous faint spiral lines also present.

Operculum (Fig. 3a, b): amber, thin, narrowly ovate, paucispiral, with eccentric nucleus. End farthest from nucleus angled.

Radula (Fig. 4): radular formula, (4-6)-1-(4-6)/1-1, 3-1-3(4), 21-26, 22-26. Width of central tooth, 28–34 μm . Basal cusps of central teeth small, originating from lateral angles; lateral angles well expanded; basal process moderately excavated. Central cusps of central and lateral teeth slightly enlarged.

Anatomy (from relaxed, preserved material; Figs. 2c–f, 3b, d, 5, 6): head-foot and dorsal visceral coil covered with dark, grey-

black epithelial pigment. Pigment somewhat lighter around the eyes, on cephalic tentacles (Fig. 5a), along broad strips along the sides of the head-foot, and on dorsal prostate gland (of male). Edge of mantle collar, sole of foot, distal lips of snout, and majority of dorsal operculigerous lobe unpigmented.

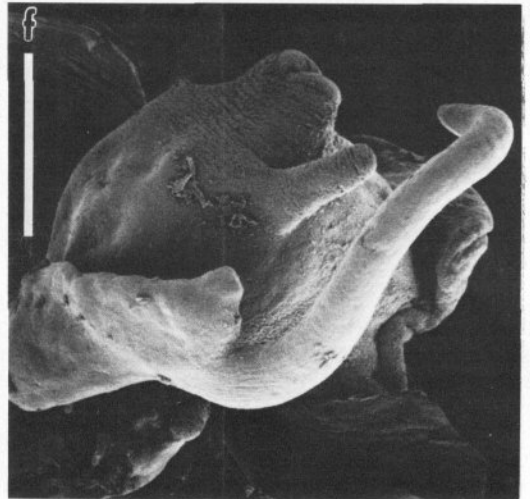
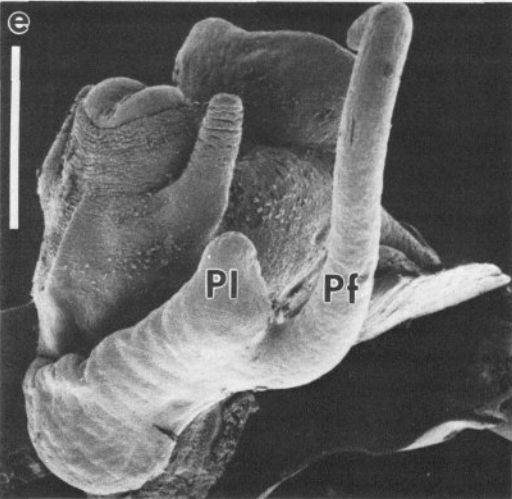
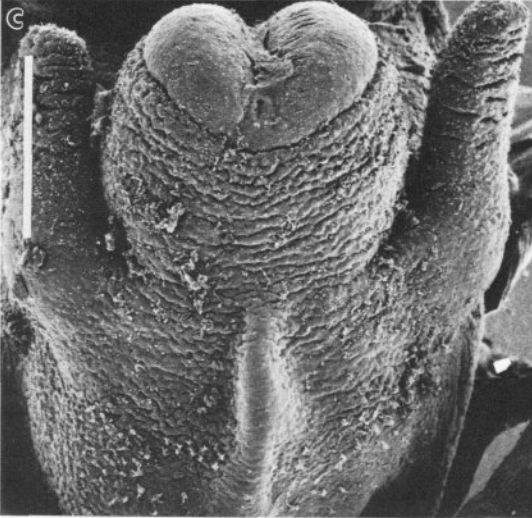
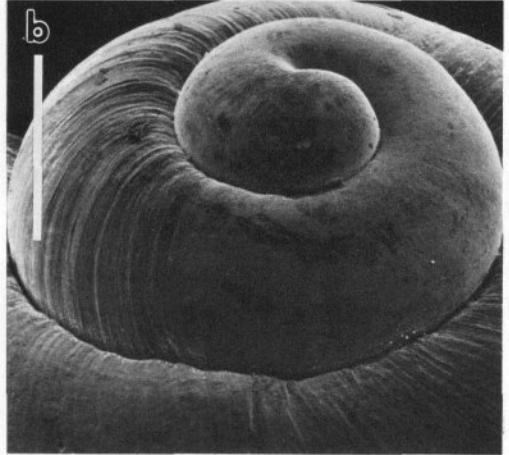
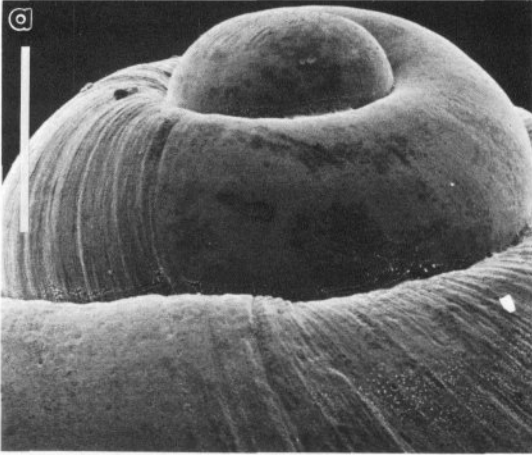
Cephalic tentacles without hypertrophied ciliary tufts (Fig. 2c). Ctenidial filaments, ca. 20, triangular, plicate, moderately broad relative to width of pallial cavity. Frontal edges of filaments with two narrow stripes of grey pigment. Osphradium about 25% of ctenidium length, slightly posterior to center of ctenidial axis. Kidney scarcely bulging into pallial cavity; renal opening small, ringed with fleshy lips. Hypobranchial gland not obvious in dissection or section. Stomach and style sac sub-equal in length; small triangular caecal chamber protruding from posterior edge of stomach.

Testis of numerous simple lobes (draining to vas efferens), large (1.5 whorls), filling about 50% of body length and extending from near apical tip of animal to posterior edge of prostate gland (covering stomach). Seminal vesicle of a few thickened coils pressed against posterior edge of stomach. Prostate gland small, bean-shaped, with about 50% of length in pallial roof. Anterior vas deferens exiting proximal to tip of gland. Penis (Figs. 2d–f, 3d, 6) moderate-large, usually uncoiled and protruding beyond edge of mantle collar. Black sub-epithelial pigment dense in virtual entirety of filament, somewhat lighter in lobe and scattered in

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Fig. 2. SEM micrographs of shell protoconchs and critical point dried bodies of *P. bruneauensis*. a, b, Protoconch, paratypes, USNM 860508 (scale bars = 136 μm , 150 μm); c, Dorsal head, USNM 860509 (200 μm); d, Dorsal aspect of penis, USNM 860508 (250 μm); e, f, Dorsal aspects of head-foot and penis, USNM 860509 (0.43 mm). Pf = penial filament; Pl = penial lobe.

Fig. 3. Operculae and histological sections of *P. bruneauensis*, paratypes, USNM 860508. a, Dorsal operculum (0.38 mm); b, Cross section of mid capsule gland (0.1 mm). Arrow indicates ventral channel of gland; c, Ventral operculum (0.38 mm); d, Cross section of male just posterior to nerve ring (0.25 mm). Note elongate, muscular penis (to left).





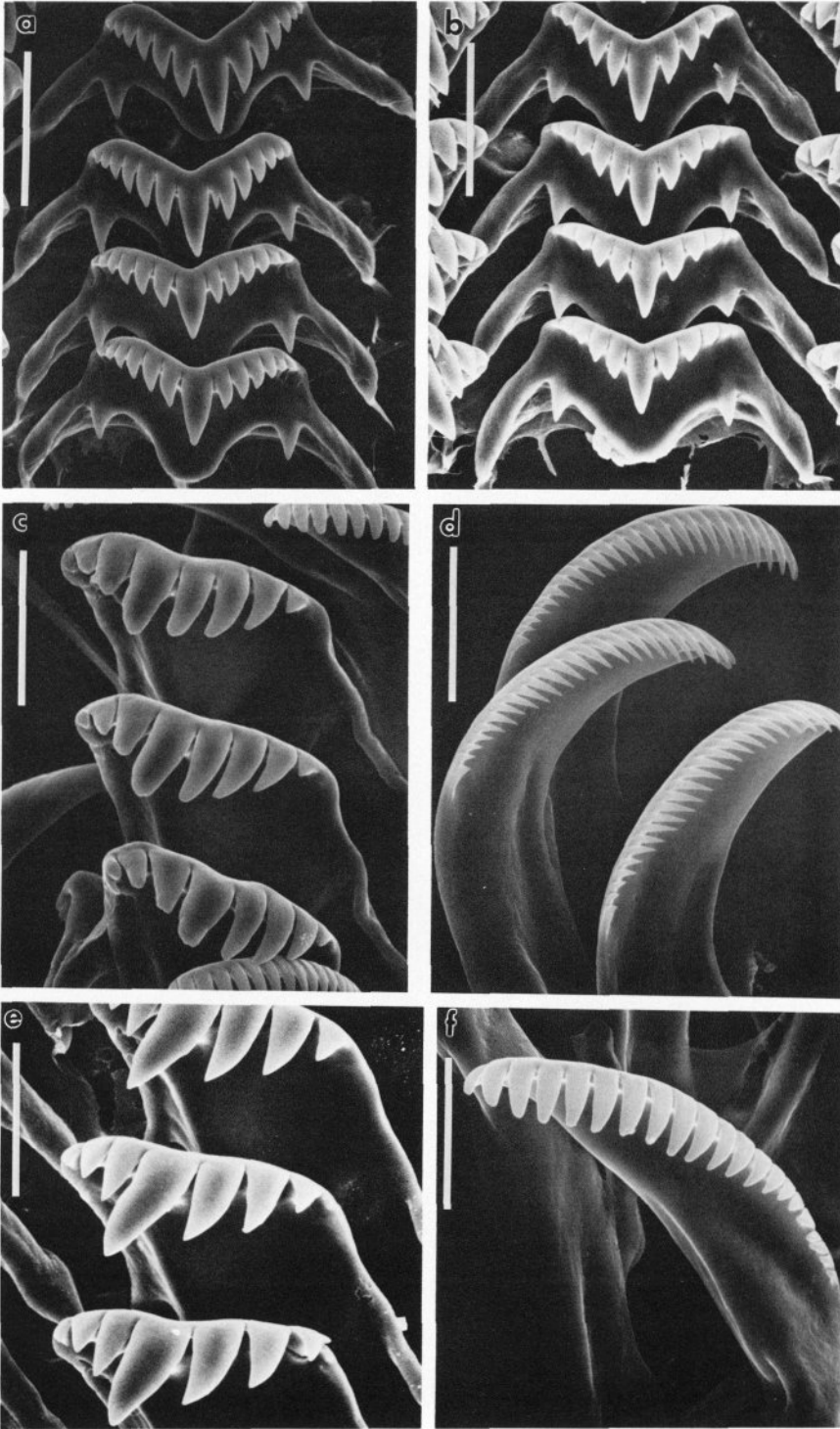


Fig. 4. SEM micrographs of radulae of *P. bruneauensis*. a, Central teeth, paratypes, USNM 860508 (15.0 μm); b, Centrals, USNM 860510 (13.6 μm); c, Laterals, USNM 860508 (12.0 μm); d, Outer marginals, lot as above (7.5 μm). e, Laterals, USNM 860510 (10.0 μm); f, Inner marginal, USNM 860508 (7.5 μm).

remaining penis. Dorsal penis without hypertrophied ciliary patches. Filament narrow, equal to or longer than proximal penis, much longer than lobe. Filament tapering little along most of length, near-circular in cross section. Thick layer of circular muscles of filament obvious in section (Fig. 3d). Lobe stout, slightly tapered distally. Single glandular ridge confined to lobe, usually along distal edge. Vas deferens uncoiled in penis, positioned near outer edge.

Ovary about one whorl, of simple lobes, covering posterior stomach chamber. Albumen gland (Ag) slightly longer than capsule gland (Cg). Renal oviduct (Ov) with large, complex coil on posterior albumen gland. Seminal receptacle (Sr) a small sac with short duct into posterior loop of oviduct. Bursa copulatrix (Bu) moderate-sized, ovate, partly posterior to albumen gland. Duct from bursa copulatrix broad and elongate, traversing much of albumen gland before joining oviduct. Ventral channel (Vc) moderately wide, separated from capsule gland lumen by pronounced fold (Fig. 3b). Capsule gland opening simple, sub-terminal. Distal to opening, edge of gland (base of ventral channel) continued distally (as gutter) to near edge of mantle collar (not illustrated).

Variation.—Shells from the Hot Creek spring and those along the Bruneau River differed significantly in shell measurements (9 of 12 pairwise comparisons [by sex] significant, $P \leq 0.05$, Tukey HSD Test) and translation rate ($0.4 > P > 0.3$), reflecting the larger size and squatter shells from the type locality. These populations also are differentiated by penial form, with males from the type locality (Fig. 6a–d) having smaller penes (scarcely protruding beyond mantle collar) with shorter filaments than those from the Hot Creek spring (Fig. 6f–i). These differences do not, however, appear to justify taxonomic distinction of the populations.

Etymology.—The species name refers to the snail's occurrence in Bruneau River drainage.

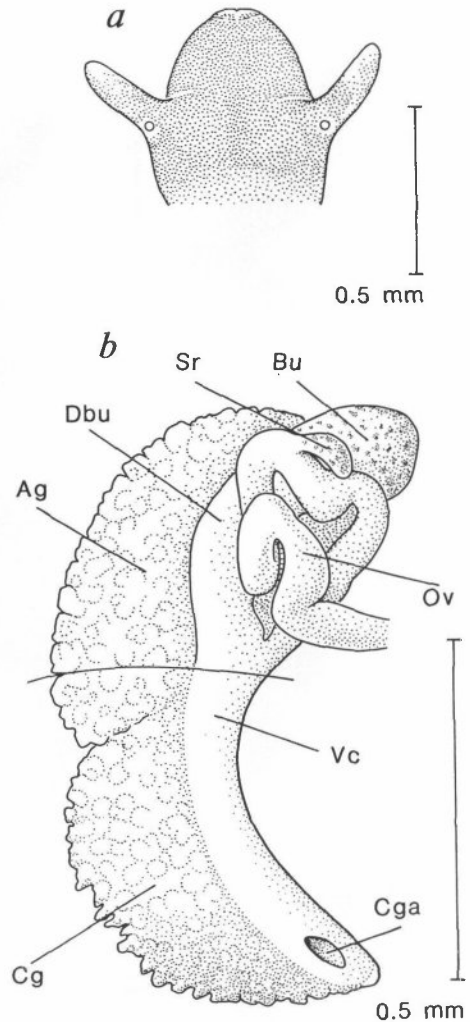


Fig. 5. Anatomy of *P. bruneauensis*, paratypes, USNM 860508. a, Dorsal aspect of head showing typically near-uniform dark pigment; b, Left lateral aspect of pallial oviduct and associated structures. Ag = albumen gland; Bu = bursa copulatrix; Cg = capsule gland; Cga = opening of capsule gland; Dbu = duct from the bursa copulatrix; Ov = renal oviduct; Sr = seminal receptacle; Vc = ventral channel of capsule gland.

Remarks.—*Pyrgulopsis bruneauensis* is readily separable from all but one hydrobiid of the Snake River and adjacent areas by its small size and squat shell (“*Fluminicola*” *minutissima* Pilsbry, 1907, from Snake River basin near the Idaho-Oregon border is even smaller and more globose than the

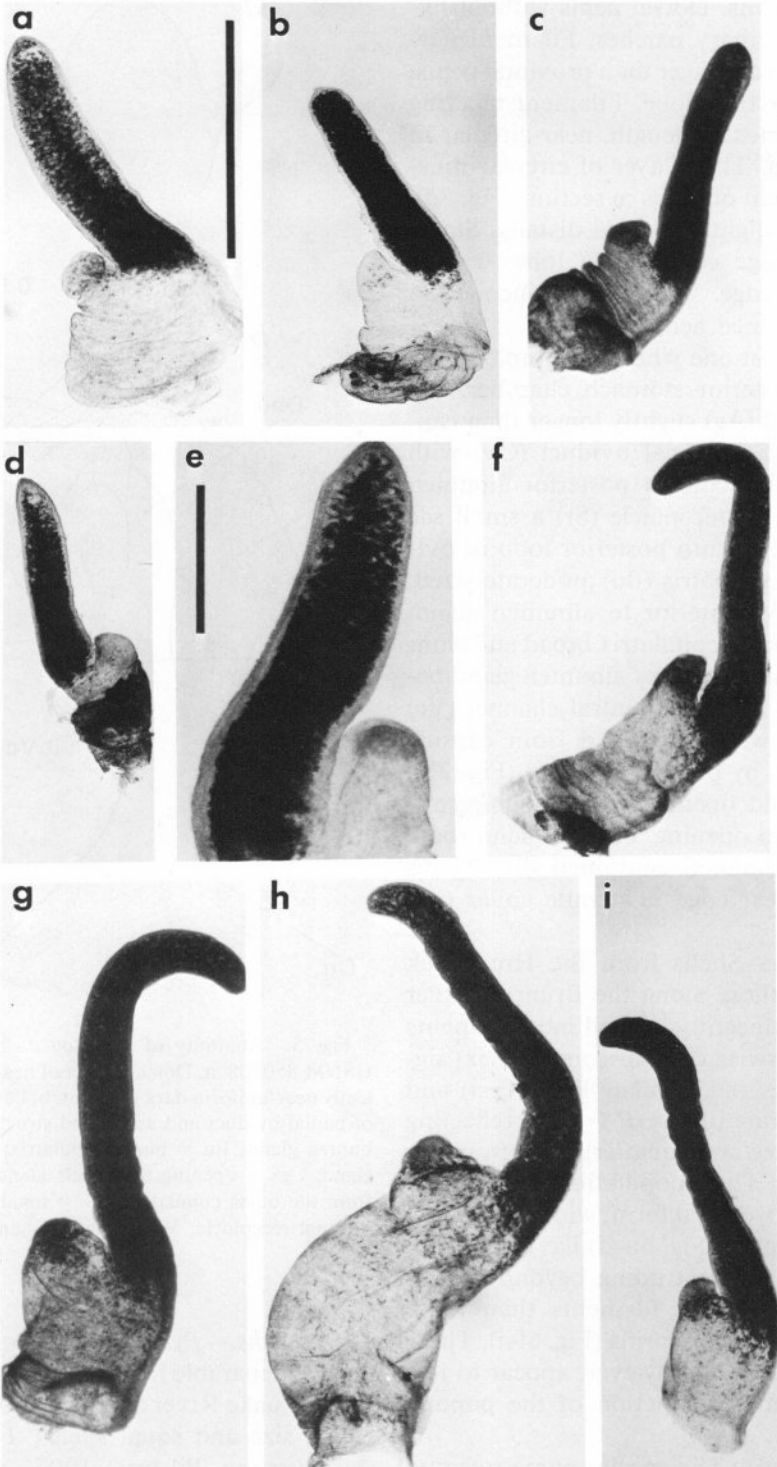


Table 1.—Shell parameters for *Pyrgulopsis bruneauensis*. WH = number of whorls, SH = shell height, SW = shell width, LBW = length of body whorl, WBW = width of body whorl, AL = aperture length, AW = aperture width, W = whorl expansion rate, D = distance of generating curve from coiling axis, T = translation rate, SA = aperture shape. Measurements are in mm.

	WH	SH	SW	LBW	WBW	AL	AW	W	D	T	SA
USNM 560507 (holotype)	4.00	2.48	2.03	2.12	1.60	1.39	1.25	1.74	0.60	3.55	1.11
USNM 560508 (paratypes)	\bar{X} 3.81	2.34	1.96	2.01	1.49	1.30	1.22	2.09	0.56	3.88	1.07
(♂, n = 8)	s 0.12	0.10	0.12	0.12	0.07	0.07	0.08	0.17	0.04	0.53	0.04
(paratypes)	\bar{X} 3.79	2.24	1.79	1.89	1.41	1.21	1.08	2.16	0.54	3.96	1.12
(♀, n = 7)	s 0.17	0.15	0.04	0.10	0.05	0.07	0.03	0.37	0.05	0.41	0.04
USNM 560509 (♂, n = 10)	\bar{X} 3.90	2.78	2.36	2.35	1.82	1.47	1.35	2.02	0.55	3.29	1.09
	s 0.18	0.16	0.20	0.17	0.13	0.12	0.11	0.19	0.03	0.42	0.07
(♀, n = 10)	\bar{X} 3.88	2.35	1.96	2.02	1.50	1.36	1.13	2.26	0.53	3.31	1.21
	s 0.21	0.16	0.08	0.12	0.06	0.08	0.05	0.32	0.04	0.43	0.05

above). The penis of *P. bruneauensis* is similar to that of *P. amargosae* from Death Valley System, California, in that the latter also has an elongate filament darkly pigmented with sub-epithelial granules (Hershler 1989:figs. 17b, 18b–e). A close historic relationship between the upper Snake River (prior to its integration with the lower river) and Lahontan drainage to the south (which then was integrated with Death Valley System) was postulated by Minckley et al. (1986: 534, fig. 15.4). A detailed discussion of the relationships of *P. bruneauensis* must, however, await anatomical study of other regional *Pyrgulopsis*.

Distribution and habitat.—The snail occurs in small thermal springs (to 35°C) along Hot Creek and along the Bruneau River in the immediate vicinity of the creek's confluence (Figs. 7, 8).¹ Hot Creek, fed by numerous small springs, flows about one km

before entering Bruneau River near the mouth of Bruneau Canyon. Discharge of the creek historically was at least 4.0 cfs (Waring 1965:30). At the upper end of the creek springflow historically drained via Hot Creek Falls into a large pool (Indian Bath-tub), which now is virtually dry (compare Fig. 8b and 8c) as a result of water table decline. During a trip to the area on 23 June 1989, the following snail-positive localities were visited:

¹ Local endemism of this species appears likely. There are no historic records for the snail from extra-limital areas, and a helicopter survey of thermal springs in southwest Idaho and southeastern Oregon (Bruneau, Jarbridge, South Owyhee River basins) conducted during January 1987 did not reveal additional populations (S. M. Chambers, unpublished report, February 3, 1987; Hershler, personal observations on materials collected on this survey).

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Fig. 6. Whole mounted penes of *P. bruneauensis*. a–e, Paratypes, USNM 860508 (a–c, dorsal, d, e, ventral aspects). f–i, USNM 860509 (dorsal aspects). The scale bar in "a" equals 1.0 mm. All other photographs are printed to the same scale except "e" (0.25 mm). Note the darkly pigmented filament and small area of glandular ridges in the distal penial lobe (particularly obvious in "e").

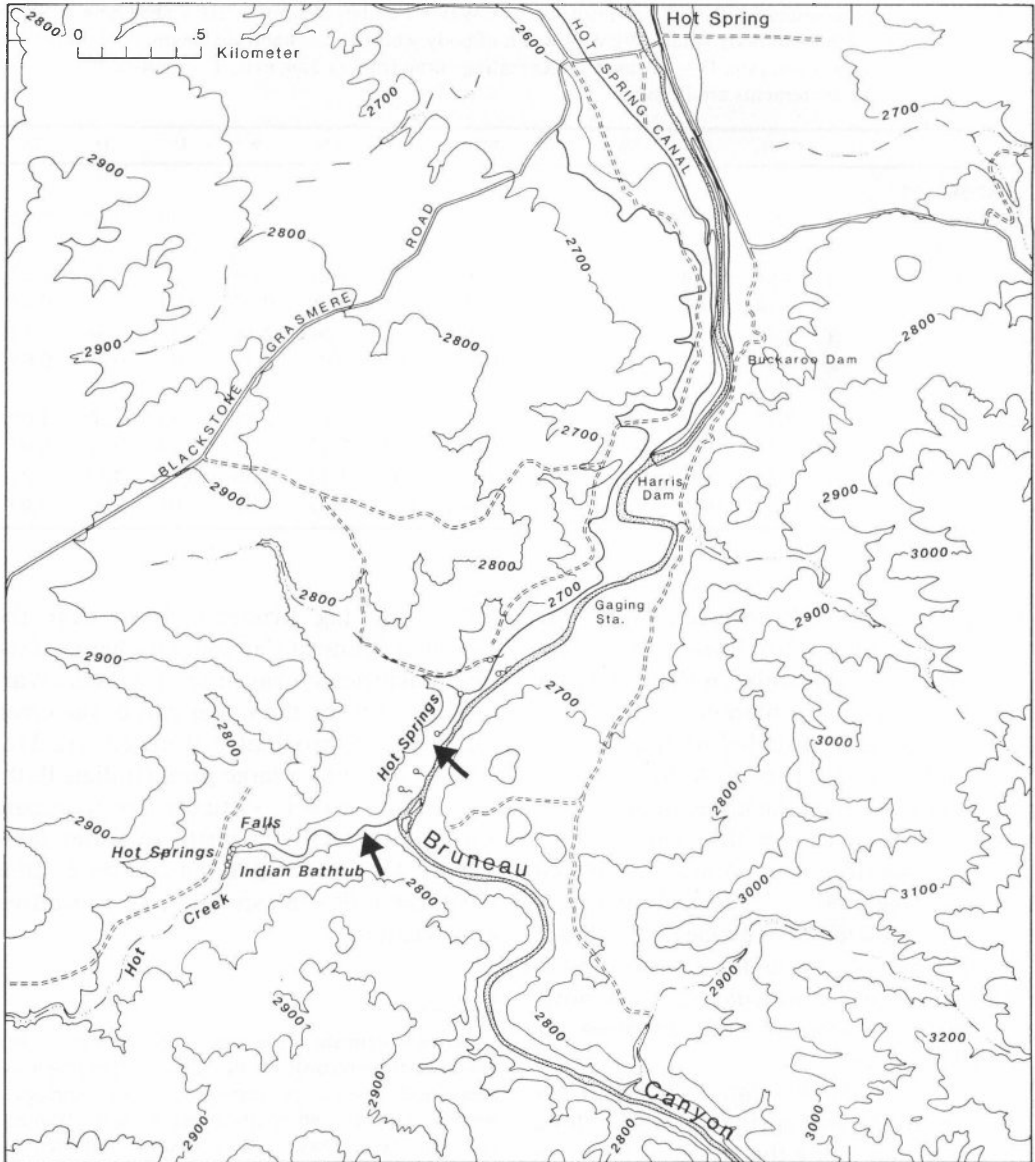


Fig. 7. Map showing collecting localities in Hot Creek area, Owyhee County, Idaho. Modified from USGS 1947 Hot Spring quadrangle (7.5 minute series [topographic]).

(a) Small (ca. 10 cm²) seep on rock wall just above floor of Indian Bathtub. About four snails were observed (none collected) on the algal-covered drip wall (none found in small pool below).

(b) Small seeps emerging along base of low outcrop on the east side of lower Hot

Creek. Snails were common just below spring orifices, on moistened ground covered by grass.

(c) A large (3–4 m high, 3 m across) drip wall on western side of Bruneau River downflow from Hot Creek confluence. Snails were extremely common on the wet, algal-

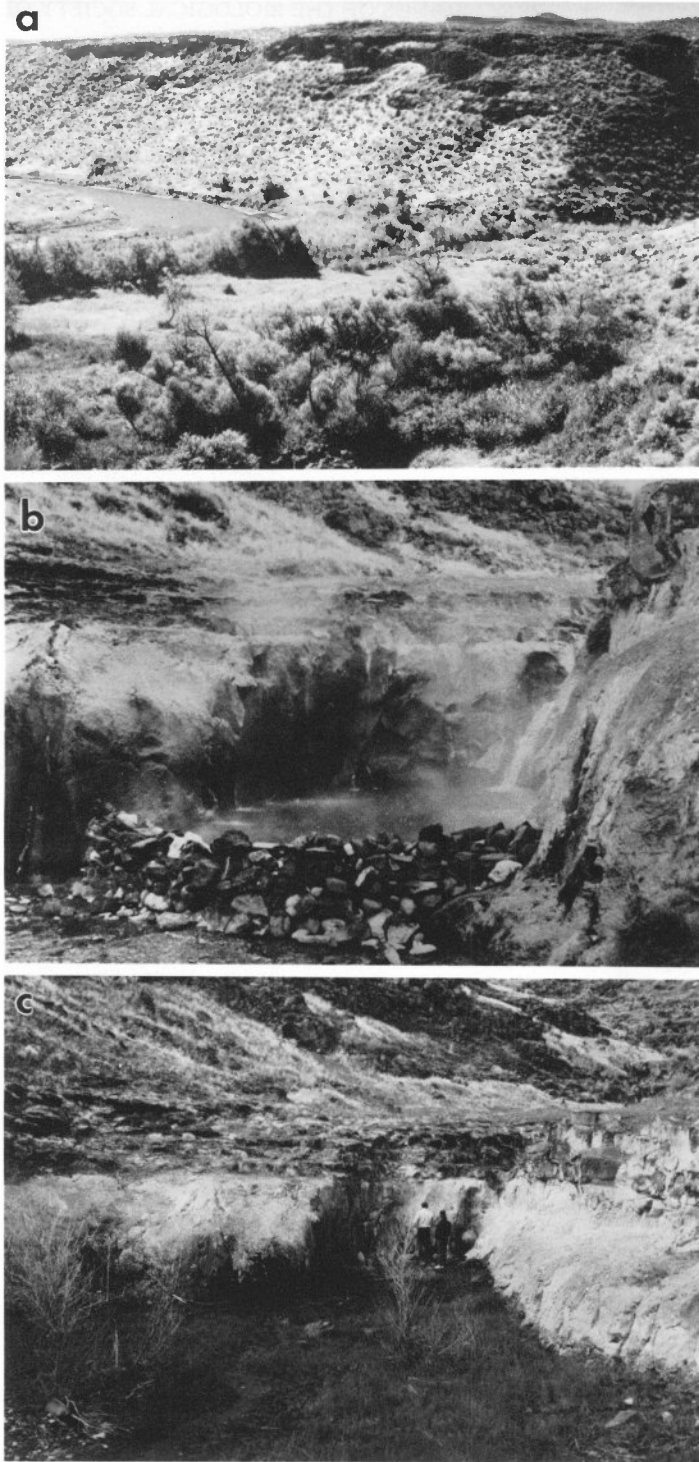


Fig. 8. Photographs of the Hot Creek area. a, Confluence of Hot Creek (to right) and Bruneau River, 9-20-89; b, Indian Bathtub under historic flow conditions, 11-73; c, Indian Bathtub and upper Hot Creek under recent flow conditions, 4-4-89.

covered walls and in a pool below. Snails have also been collected from small thermal spring vents along the east side of the river just upflow from the creek's confluence (P. Olmstead, pers. comm., June 1989).

Several basommatophoran pulmonates were found in association with *P. bruneauensis* in the spring brooks, and an unrelated hydrobiid, *Fluminicola* cf. *hindsii* (Baird), was collected at the confluence of Hot Creek and the Bruneau River.

Acknowledgments

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